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Difference in Temporal Parameters of Obese & Non-Obese Female In Walking

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Obesity is one of the leading health complications in the world, one of the most serious public health challenges of the 21st century it effect on every system of human body, locomotory system. The present study is a quantitative study, which was designed to investigate the variations of selected gait parameters between obese & non-obese females aged between 12-14 years. The whole sample consisted of 50 subjects with equal number of obese (50) and non-obese (50) females. The subjects were instructed to run across a pre-designed walkway at their maximum speeds. During this, they were filmed using high-resolution cameras. The criterion measures of interest were spatial parameters. Conclusion: the Step and Stride length of non-obese females is higher than obese females of same age category.

Keywords: locomotory system, obese and non-obese

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Introduction

The World Health Organization (W.H.O) considers obesity in childhood as "one of the most serious public health challenges of the 21st century". Obesity is defined as the excess of body fat. This definition may vary depending on the region however in Western countries such as U.S and in many European countries it is defined by body mass index (BMI). The BMI is calculated by dividing the weight over the square of height. If BMI is higher than 30 kg/m2 that indicates the obesity. Kopelman, P.G. (2000). Under that range is classified as overweight, average weight and underweight depending on values Walking is the most Activity in our daily life, and thus, increasing the daily number of steps in children and adolescents has received considerable attention for combating the obesity epidemic. Obesity is known to be associated with biomechanical alterations in the gait pattern, which may predispose children and adolescents with overweight or obesity (OW/OB) to short- and long-term musculoskeletal disorders (MSKD). From early childhood, OW/OB has been associated to the development of various MSKD (i.e., musculoskeletal pain, injuries and fractures) which may be extended to adulthood with notable consequences with regard to physical disability, quality of life and healthcare economic costs. Among other suggested explanations, increased joint loads, together with biomechanical alterations during loco-motor tasks, may be underlying the higher prevalence of MSKD in this population Kopelman, P.G. (2000).

Walking is an important skill and it makes a big difference in how one's life turns out. Walking doesn't come automatically, from a young age we struggle to crawl – and then we crawl everywhere we can. Next, we try pulling ourselves to stand at a table leg, at father's leg, at the stair steps. We grunt and push and pull and fall and roll and bump, then try again and keep it up over and over again, and never quit in spite of face-falls and nose bruises – all because we want to be what we feel, persons come to be by walking (Hills, A.P., & Parker, A.W. 1991. Locomotion (walking and running) is the most common of human movements. It is one of the more difficult movement tasks that we learn, but once learned it becomes almost subconscious. The sole purpose of walking and running is to transport the body safely and efficiently across the ground (Winter, 1984). Gait is very different Between individuals and also varies from step to step within an individual. Gait consists of a harmonious set of complex and cyclical movements of the body parts through a dynamic interaction of the internal and external forces Songhua Yan, et al (2014). A complete cycle of gait comprises two consecutive contacts of the same heel with the support surface, and the time interval between these two contacts is called the length of the gait cycle.

The objective of the present study was to find the difference in walking between various temporal parameters of Obese and non obese subjects

Methodology

A total 100 female children (50 obese & 50 non-obese) whose age ranges from 12-14 years were selected for the present study. After studying literatures related to the study and consultation with experts, following variables were selected for the present study.

Variable selected for present study **temporal Parameters**

01. Cadence (steps /mint)

02. subject velocity (cms/sec)

- Gait cycle duration (sec)

01. Double support Phase (sec)

These are time dependent measurements and were measured in the following way:

Cadence Measurement: It is measured as the number of steps per unit time, usually expressed as steps/minute as an individual walks or runs. The time duration of five steps taken by subject was recorded (1.640 sec) and accordingly the number of steps in one minute or sixty seconds was calculated.

Subject Velocity: Velocity is the rate of change of position with respect to some frame of reference. It was calculated as the displacement over time. The subject's centre of gravity was taken as a stationary point, its displacement was measured, and time recorded as subject moved from one point to other.

Gait Cycle Duration It is the period elapsed between the successive heel contacts of the same foot. It encompasses in it the two phases durations; stance phase duration and swing phase duration. It is measured in seconds.

Double support phase :

It is the period of time in gait cycle during which the foot remains in contact with the ground. It is measured in seconds

The subject's walking gait was recorded using two synchronized Legaria SF10 Cannon Camcorder. The specifications were full HD 1080, 8.1 Mega Pixels, 10x Optical Zoom, a shutter speed of 1/2000, Aperture value of maximum (F 1.8) and minimum (F8.0) and frame rate of 50 Hz. It also contains video compression format (MEEG/JPEG), having hard disk and USB cable to transport videos from the hard disk by connecting it to the computer. To analyze the clipped or slashed video recording of the running gait of school children, softwares; Xilisoft Video Converter Ultimate 6.0 and Silicon Coach Pro-7 were used. These motion analysis softwares provide to identify and quantify the angles, velocity, displacement, time, and number of frames of the selected biomechanical parameters of the study.

Table 4.5: Descriptive Statistics of Temporal Parameters

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
Cadence (steps /mint)	Non-obese	50	107.76	3.221	.455	106.8519	108.6833	101.00	115.00
	obese	50	107.76	3.221	.455	106.8519	108.6833	101.00	115.00
	Total	100	107.76	3.205	.320	107.1315	108.4037	101.00	115.00
subject velocity (cms/sec)	Non-obese	50	115.58	3.765	.532	114.5102	116.6506	105.00	121.00
	obese	50	115.58	3.765	.532	114.5102	116.6506	105.00	121.00
	Total	100	115.58	3.746	.374	114.8370	116.3238	105.00	121.00
Gait cycle duration (sec)	Non-obese	50	1.20	.231	.032	1.1425	1.2743	.67	1.65
	obese	50	1.20	.231	.032	1.1425	1.2743	.67	1.65
	Total	100	1.20	.230	.023	1.1627	1.2541	.67	1.65
Double support Phase (sec)	Non-obese	50	29.80	3.471	.491	28.8185	30.7919	23.30	37.50
	obese	50	29.80	3.471	.491	28.8185	30.7919	23.30	37.50
	Total	100	29.80	3.454	.345	29.1198	30.4906	23.30	37.50

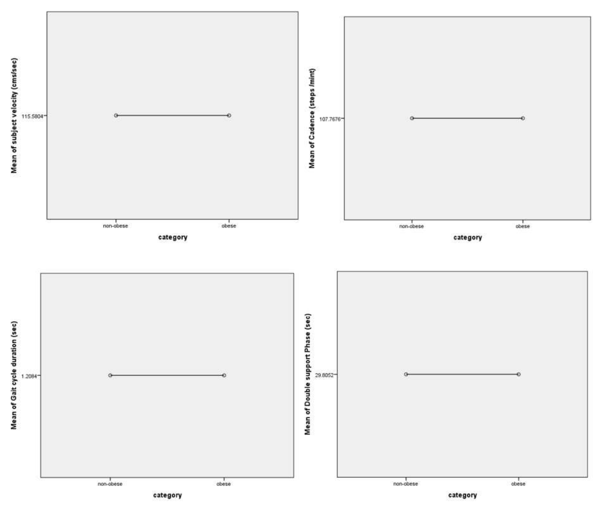
The table showss the means and standard deviations of 12-14 years Non-obese & Obese females aged 12-14 years for Temporal parameters. The mean and SD of Cadence of Non-obese females is 107.76 ± 3.22 cms, and for obese females 107.76 ± 3.22 cms. The mean and SD of Subject velocity of Non-obese females is 115.58 ± 3.76 cms, and for obese females is 115.58 ±3.76cms. The mean and SD of Gait Cycle Duration of Non-obese females is 1.20 ± .23 cms, and for obese females 1.20 ± .23cms. The mean and SD of Double Support Phase of Non-obese females is 29.80 ± 3.47cms, and for obese females is 29.80 ±3.47cms.

Table 4.6: ANOVA Summary of Temporal Parameters

		Sum of Squares	df	Mean Square	F	Sig.
Cadence (steps /mint)	Between Groups	.000	1	.000	.000	1.000
	Within Groups	1017.31	98	10.381		
	Total	1017.31	99			
subject velocity (cms/sec)	Between Groups	.00	1	.000	.000	1.000
	Within Groups	1389.74	98	14.181		
	Total	1389.74	99			
Gait cycle duration (sec)	Between Groups	.00	1	.000	.000	1.000
	Within Groups	5.26	98	.054		
	Total	5.26	99			
Double support Phase (sec)	Between Groups	.00	1	.000	.000	1.000
	Within Groups	1181.32	98	12.054		
	Total	1181.32	99			

*The mean difference is significant at the 0.05 level.

A one-way ANOVA was conducted to investigate the difference in Temporal parameters between different Obese and Non-obese females aged (12-14 years. Results of table 4.6 reveal that None of the temporal parameters showed statistically significant difference.



Mean Plots of cadence, Subject velocity, Gait Cycle Duration and Double Support Phase of both Non-obese and obese females aged 12- 14 yrs.

Conclusion

S. No	Parameter	Inference	Description of Inference
01	Cadence (Steps/min)	No statistically significant difference in Cadence was observed between non-obese & obese females	the cadence of non-obese females was same as obese females of same age category.
02	Subject velocity (mtr/sec)	No statistically significant difference in subject velocity was observed between non-obese & obese females	the subject velocity of non-obese females was same as obese females of same age category.
03	Gait Cycle Duration (Sec)	No statistically significant difference in Gait Cycle Duration was observed between non-obese & obese females	the Gait Cycle Duration of non-obese females was same as obese females of same age category.
04	Stance Phase Duration (Sec)	No statistically significant difference in Stance Phase was observed between non-obese & obese females	the Stance phase of non-obese females was same as obese females of same age category.
05	Swing Phase Duration (Sec)	No statistically significant difference in swing phase duration was observed between non-obese & obese females	the swing phase duration of non-obese females was same as obese females of same age category.

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